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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/940,475	08/29/2001	Hideki Sawaguchi	ASAM.0019	4883

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EXAMINER

RODRIGUEZ, GLENDA P

ART UNIT PAPER NUMBER

2627

DATE MAILED: 08/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/940,475

Applicant(s)

SAWAGUCHI ET AL.

Examiner

Glenda P. Rodriguez

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-46 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-42 is/are allowed.
- 6) ☒ Claim(s) 1,6-12,17-26 and 43-46 is/are rejected.
- 7) ☒ Claim(s) 2-5 and 13-15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 6-9, 12, 17-2025, 26 and 43-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ziporovich (US Patent No. 5, 459, 679) in view of Mallary (US Patent No. 6, 359, 744).

Regarding Claim 1, Ziporovich teaches a magnetic recording/reproducing apparatus comprising a medium and a reproducing head constituted by a magneto resistive effect type head with a shield film (Elements 12 and 10),

Wherein a reproduced signal outputted from said reproducing head is processed through a partial response equalization circuit (Col. 5, L. 21-27, wherein Ziporovich teaches a PRML channel) having a frequency characteristic so that a low-frequency component of said reproduced signal including a direct current component is passed and suppressed through said partial response equalization circuit (See Col. 8, under DC Offset Control Loop, wherein Ziporovich teaches how the PRML channel cancels the Offset of the signal. It is obvious that because the DC offset is found at frequency value 0, when the DC offset is eliminated, the low frequencies are also diminished or eliminated when eliminating the DC offset.);

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And wherein said reproduced signal is supplied to a maximum-likelihood decoder so as to be data-reproduced (Col. 1, L. 50-65, wherein it describes that PRML channels contain ML of Maximum Likelihood detectors.).

However, Ziporovich does not explicitly teach that the medium is a dual layer perpendicular medium and it has a soft underlayer. Mallory teaches a perpendicular dual layer medium with a soft underlayer in Elements 30, 115 and 120. It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to modify Ziporovich's invention with the teaching of Mallory in order to increase data storage capacity as taught by Mallory in the Summary of the invention.

Claim (12) has limitations similar to those treated in the above rejection, and is met by the references as discussed above.

Claim (25 and 26) have limitations similar to those treated in the above rejections, and are met by the references as discussed above.

Regarding Claims 6 and 17, the combination of Ziporovich and Mallory teach all the limitations of Claims 1 and 12, respectively. The combination further teach wherein comprising a plurality of partial response equalization circuits having different direct current frequency component passing characteristics respectively or a plurality of partial response equalization circuits defined by different values of parameter  $a$  respectively, wherein a reproduced signal from said reproducing head is supplied to said plurality of partial response equalization circuits so as to be waveform-equalized in said partial response equalization circuits (Col. 6, L. 2-14 of Ziporovich).

Regarding Claims 7 and 18, the combination of Ziporovich and Mallory teach all the limitations of Claims 1 and 12, respectively. The combination further teach one of

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different direct current frequency component passing characteristics or one of different values of parameter  $\alpha$  is selected and set in said partial response equalization circuit, and wherein said reproduced signal from said reproducing head is supplied to said partial response equalization circuit so as to be waveform-equalized (Col. 6, L. 2-14 of Ziporovich).

Regarding Claims 8, 19, 43 and 45, the combination of Ziporovich and Mallary teach all the limitations of Claims 6, 17, 18 and 7, respectively. The combination further teach wherein at least one of said different direct current frequency component passing characteristics is a cut-off characteristic of a direct current frequency component, or at least one of different values of said parameter  $\alpha$  satisfies a condition of  $\alpha=1$  (Col. 12, L. 56-63 of Ziporovich).

Regarding Claims 9, 20, 44, 46, the combination of Ziporovich and Mallary teach all the limitations of Claims 8, 19, 43 and 45, respectively. The combination further teach wherein a signal for adjusting or controlling a circuit disposed in a pre-stage of said partial response equalization circuit is referred to from a circuit in a post-stage of said partial response equalization circuit having said cut-off characteristic of said DC frequency component, or from a circuit in a post-stage of said response equalization circuit having said parameter  $\alpha$  satisfying  $\alpha=1$  (Col. 8, under "DC Offset Control Loop", wherein Ziporovich teaches the post stage equalization of the signal in order to eliminate the offset. See also Col. 12, L. 56-63 of Ziporovich).

3. Claims 10, 11, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ziporovich and Mallary as applied to claim 1 above, and further in view of Hull et al. (US Patent No. 6, 262, 857).

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Regarding Claims 10 and 21, the combination of Ziporovich and Mallery teach all the limitations of Claims 1 and 12, respectively. However, the combination does not explicitly teach wherein an information data bit sequence to be recorded is converted into a data bit sequence so that a maximum number  $m$  of consecutive recording transitions recorded at a shortest bit length interval on said recording medium is limited to a finite value; and then said converted data bit sequence is recorded on said recording medium. This limitation is taught by Hull et al., wherein its Gray code (which is a finite amount of data) is written in the shortest bit length as taught in Col. 35, L. 1-7. It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to modify the combination's invention with the teaching of Hull et al. in order to detect its position in a disk as taught in Col. 34, L. 61-65.

Regarding Claims 11 and 22, the combination of Ziporovich, Mallery and Hull et al. teach all the limitations of Claims 10 and 21, respectively. The combination further teach wherein the transitions cannot be larger than 4 (Col. 34, L. 61-65. It is obvious that the Gray code can be adjusted to a finite amount of bits.).

4. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ziporovich and Mallery as applied to claim 12 above, and further in view of Kikuta (US Patent No. 6, 377, 416).

Regarding Claim 23, the combination of Ziporovich and Mallery teach all the limitations of Claim 12. However, the combination does not explicitly teach wherein a semiconductor integrated circuit. This is taught by Kikuta in Col. 1, L. 9-16. It would have been obvious to a person of ordinary skill in the art, at the time the invention was

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made, to modify the combination's invention with the teaching of Kikuta in order to have faster reading/writing speeds as taught by Kikuta in the Background of the Invention.

Regarding Claim 24, the combination of Ziporovich, Mallary and Kikuta teach all the limitations of Claim 23. The combination further teach wherein a semiconductor is mounted thereon (See Col. 1, L. 9-16 of Kikuta).

*Allowable Subject Matter*

5. Claims 2-5, 13-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding Claim 2, the primary reason for allowable subject matter is the inclusion of the limitation wherein reproduced waveforms corresponding to a pair of the two closest recording transitions recorded on said recording medium at a shortest bit length interval are outputted as a waveform having intersymbol interference with amplitude ratios ( $A_1, A_2, A_3, \dots, A_k, \dots, A_N$ ) ( $k$  is an integer indicating a bit interval, and  $A_1$  and  $A_N$  are non-zero real numbers with opposite signs:  $A_1 + A_2 + A_3 + \dots + A_k + \dots + A_N \neq 0$ ,  $N \geq 2$ ) at each bit interval through said partial response equalization circuit, or as a dipulse waveform having asymmetrical amplitudes with opposite polarities through said partial response equalization circuit; and wherein said outputted waveforms are supplied to said maximum-likelihood decoder so as to be data-reproduced.

6. Claims 27-42 are allowed.

The following is an examiner's statement of reasons for allowance: the primary reason for allowance subject matter is the inclusion of the limitation wherein said reproduced waveform corresponding to a pair of the closest two recording transitions recorded on said recording medium at a shortest bit length interval are outputted as a waveform having intersymbol interference with amplitude ratios  $(P_1, P_2 - \alpha P_1, \dots, P_k - \alpha P_{k-1}, \dots, P_N - \alpha P_{N-1}, -\alpha P_N)$  ( $\alpha$  is a value of a real number in a range of  $0 < \alpha < 1$ ,  $k$  is an integer indicating a bit interval,  $P_1, P_2, \dots, P_k, \dots, P_N$  are real numbers with the same sign and  $P_1$  and  $P_N$ : non-zero real numbers:  $N \geq 2$ ) at each bit interval through said partial response equalization circuit.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Response to Arguments***

7. Applicant's arguments with respect to claims 1-46 have been considered but are moot in view of the new grounds of rejection. Examiner acknowledges that Claims 25 and 26 were allowed, but they now stand rejected due to newly found art.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US Patent No. 6, 912, 100 and 6, 741, 412 both to Sawaguchi et al.

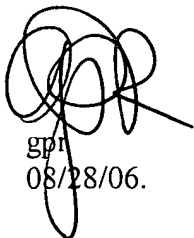


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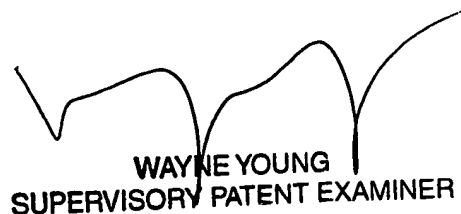
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Glenda P. Rodriguez whose telephone number is (571) 272-7561. The examiner can normally be reached on Monday thru Thursday: 7:00-5:00; alternate Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wayne Young can be reached on (571) 272-7582. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



gpr  
08/28/06.



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